Access DB# 79260

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Yvette Clarke Examiner # : 76102 Date: 11-1-02
Art Unit: 1752 Phone Number 30 5-0589 Serial Number: 9-884313
Mail Box and Bldg/Room Location: CP3 9D29 Results Format Preferred (circle): PAPER DISK E-MAIL

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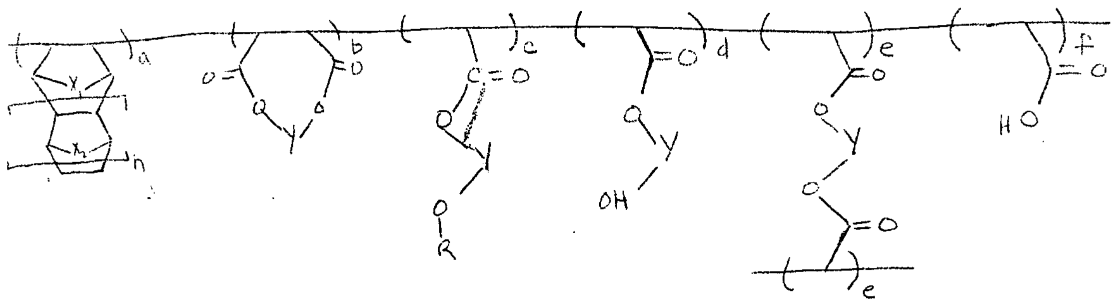
Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Photoresist polymer for top-surface imaging process by silylation and photoresist composition containing the same.
Inventors (please provide full names): Geun Su Lee, Cha Won Koh, Jae Chang Jung; Min Ho Jung, Ki Ho BAIK
Earliest Priority Filing Date: 6/21/00

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

Photoresist polymer comprising a repeating unit of Formula 1 :

Claims 1-3, 8-13



claims enclosed

$X_1, X_2 = CH_2, CH_2CH_2, O, S$

$Y =$ C_{1-10} alkylene, alkylen w/ether linkage

$R =$ acid labile protecting group

$n = 0-2$ *(no hits for case where $b \neq 0$.)

$a = 20-40$ mol%

$b = 0-20$ mol%

$c = 20-70$ mol%

$d = 0-30$ mol%

$e = 0-20$ mol%

$f = 0-20$ mol%

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Searcher: EZ	NA Sequence (#)	STN $162.20
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Searcher Location:	Structure (#) ✓ (6) (subsets)	Questel/Orbit
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Date Completed: 11-7-02	Litigation	Lexis/Nexis
Searcher Prep & Review Time: 5	Fulltext	Sequence Systems
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Online Time: 85	Other	Other (specify)

PTO-1590 (8-01)

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removing silicon dioxide layer in the exposed region; oxygen plasma etching and over-etching for etching a resist. The dry development was performed under the conditions of 35 sccmO_2, 500 W of top power, 100 W of bottom power, 75 W of bias, −30° C. and 5 mtorr. After the dry development, 110 nm L/S pattern was obtained (see **FIG. 3**).

EXAMPLE 5

[0075] To propyleneglycol methyl ethyl acetate (100 g) was added the polymer prepared in Example 2 (10 g), phthalimidotrifluoromethane sulfonate (0.06 g) and triphenylsulfonium triflate (0.06 g). The resulting solution was filtered through 0.20 μm filter to obtain a photoresist composition.

[0076] The procedure of Example 4 was repeated on the thusly-prepared photoresist composition, to obtain a 110 nm L/S pattern (see **FIG. 4**).

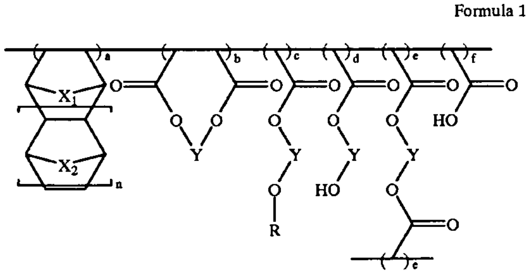
[0077] As discussed earlier, the photoresist composition can be used for the TIPS employing KrF, ArF, VUV (157 nm), EUV (13 nm) or E-beam as a light source.

[0078] Moreover, the photoresist composition has excellent resolution and adhesiveness, and thus can prevent a pattern collapse in forming a minute pattern.

What is claimed:

1. A photoresist polymer comprising a repeating unit of following formula 1:

Formula 1



wherein, X1 and X_2 are independently selected from the group consisting of CH_2, CH_2CH_2, 0 and S;

Y is C_1—C_{10} alkylene or alkylene comprising an ether linkage;

R is an acid labile protecting group;

n is an integer from 0 to 2; and

a:b:c:d:e:f is 20-40 mol %:0-20 mol %:20-70 mol %:0-30 mol %:0-20 mol %:0-20 mol %.

2. The photoresist polymer according to claim 1, wherein the acid labile protecting group is selected from the group consisting of tert-butyl, tetrahydropyran-2-yl, 2-methyl tetrahydropyran-2-yl, tetrahydrofuran-2-yl, 2-methyl tetrahydrofuran-2-yl, 1-methoxypropyl, 1-methoxy-1-methylethyl, 1-ethoxypropyl, 1-ethoxy-1-methylethyl, 1-methoxyethyl, 1-ethoxyethyl, tert-butoxyethyl, 1-isobutoxyethyl and 2-acetylmenth-1-yl.

3. The photoresist polymer according to claim 1, wherein n is 0, X_1 is CH_2, Y is CH_2CH_2 or $CH_2CH_2OCH_2CH_2$, and R is tert-butyl.

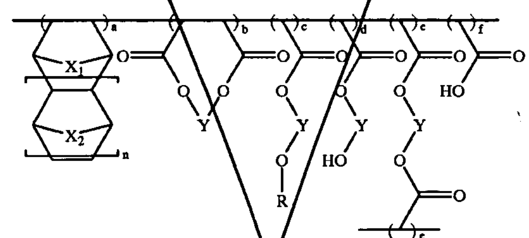
4. A process for preparing a photoresist polymer comprising:

(a) polymerizing a compound of Formula 5 with maleic anhydride to obtain a polymer of Formula 2;

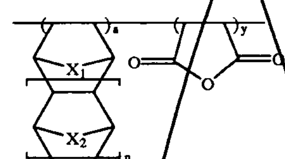
(b) reacting the polymer of Formula 2 with a diol compound of Formula 4 to obtain a polymer of Formula 3; and

(c) reacting the polymer of Formula 3 with a compound having an acid labile protecting group to obtain a polymer of Formula 1 where a hydroxyl group is partially protected.

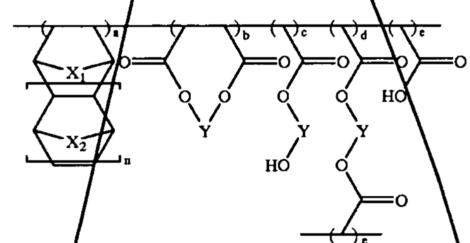
Formula 1



Formula 2



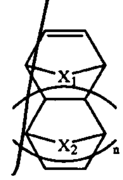
Formula 3



Formula 4

OH—Y—OH

Formula 5



Claims 1-3 + 8-13

wherein, X_1 and X_2 are independently CH_2, CH_2CH_2, O or S;

Y is C_1-C_{10} alkylene or alkylene comprising an ether linkage;

R is an acid labile protecting group;

n is an integer from 0 to 2;

in Formula 1, a:b:c:d:e:f is 20-40 mol %:0-20 mol %:20-70 mol %:0-30 mol %:0-20 mol %:0-20 mol %;

in Formula 2, x:y is 20-40 mol %:60-80 mol %; and

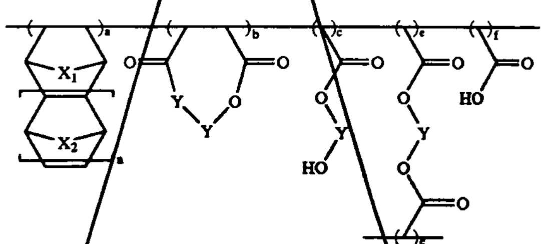
in Formula 3, a:b:c:e:f is 20-40 mol %:0-20 mol %:20-80 mol %:0-20 mol %:0-20 mol %.

5. The process according to claim 4, wherein the acid labile protecting group is selected from tert-butylcarboxylate, (C_1-C_{20}) alkyl, aryl or arylvinylether.

6. The process according to claim 4, wherein the polymerizing is carried out in a polymerization solvent selected from the group consisting of tetrahydrofuran, dimethylformamide, dimethylsulfoxide, dioxane, benzene, toluene, xylene and mixture thereof.

7. An intermediate compound represented by following Formula 3, which is used to prepare the repeating unit of claim 1.

Formula 3



wherein, X_1 and X_2 are independently CH_2, CH_2CH_2, O or S;

Y is C_1-C_{10} alkylene or alkylene comprising an ether linkage;

n is an integer from 0 to 2; and

a:b:c:e:f is 20-40 mol %:0-20 mol %:20-80 mol %:0-20 mol %:0-20 mol %.

8. A photoresist composition comprising (i) the photoresist polymer of claim 1, (ii) a photo acid generator; and (iii) an organic solvent.

9. The photoresist composition according to claim 8, wherein the photoacid generator is selected from the group consisting of phthalimidotrifluoromethane sulfonate, dinitrobenxyltosylate, n-decyl disulfone, naphthylimido trifluoromethane sulfonate and mixture thereof.

10. The photoresist composition according to claim 9, wherein the photoacid generator is selected from the group consisting of diphenyl iodide hexafluorophosphate, diphenyl iodide hexafluoroarsenate, diphenyl iodide hexafluoroantimonate, diphenyl p-methoxyphenyl triflate, diphenyl p-toluenyl triflate, diphenyl p-isobutylphenyl triflate, diphenyl p-tert-butylphenyl triflate, triphenylsulfonium hexafluororphosphate, triphenylsulfonium hexafluoroarsenate, triphenylsulfonium hexafluoroantimonate, triphenylsulfonium triflate, dibutylnaphthylsulfonium triflate and mixture thereof.

11. The photoresist composition according to claim 8, wherein the photoacid generator is present in an amount ranging from about 0.1 to about 10% by weight of the photoresist polymer.

12. The photoresist composition according to claim 8, wherein the organic solvent is selected from the group consisting of ethyl 3-ethoxypropionate, methyl 3-methoxypropionate, cyclohexanone, propyleneglycol methyl ether acetate, n-heptanone, ethyl lactate and mixture thereof.

13. The photoresist composition according to claim 8, wherein an amount of organic solvent ranges from about 300% to about 1500% by weight of the photoresist polymer.

14. A process for forming a photoresist pattern, comprising the steps of:

(a) coating a photoresist composition of claim 8 on a substrate of a semiconductor element to form a photoresist film;

(b) selectively exposing a portion of the photoresist film using a light source to form an unexposed portion of the photoresist film and leaving an unexposed portion of the photoresist film;

(c) applying silylating agent to the exposed portion photoresist film to produce a silylated layer on the top of the exposed portion of the photoresist film; and

(d) etching the non-exposed portion photoresist film using the silylated layer as an etching mask.

15. The process according to claim 14 further comprising pre-treating the substrate with hexamethyldisilazane before performing said step (a).

16. The process according to claim 14 further comprising a baking step before and/or after the exposure step (b).

17. The process according to claim 16, wherein the baking step or steps are performed at the temperature ranging from 70 to 200° C.

18. The process according to claim 14, wherein the light source is selected from the group consisting of ArF, KrF, EUV, VUV, E-beam, X-ray and ion beam.

19. The process according to claim 14, wherein the irradiation energy is in the range of from 1 to 50 mJ/cm^2.

20. The process according to claim 14, wherein the silylation agent is selected from the group consisting of hexamethyldisilazane, tetramethyldisilazane and bis(dimethyl amino)dimethyl silane, bis(dimethyl amino)methyl silane, dimethylsilyl dimethylamine, dimethylsilyl diethylamine, trimethylsilyl dimethylamine, trimethylsilyl diethylamine, dimethylamino pentamethyldisilane and mixture thereof.

21. A semiconductor element manufactured with the process of claim 14.

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